

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau



(43) International Publication Date  
4 August 2005 (04.08.2005)

PCT

(10) International Publication Number  
**WO 2005/069955 A2**

- (51) International Patent Classification: Not classified (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (21) International Application Number:  
PCT/US2005/001944
- (22) International Filing Date: 21 January 2005 (21.01.2005)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/538,273 21 January 2004 (21.01.2004) US
- (71) Applicant (for all designated States except US): IDAHO RESEARCH FOUNDATION, INC. [US/US]; Morrill Hall 103, University of Idaho, Moscow, ID 83844-3003 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): WAI, Chien, M. [US/US]; 472 Ridge Road, Moscow, ID 83843 (US). YE, Xiang-Rong [CN/US]; 9565 Genesee Avenue,, Apt. D-1, San Diego, CA 92121 (US). LIN, Yuehe [CN/US]; 544 Fuller Street, Richland, WA 99352 (US).
- (74) Agent: BAKER, Theodore, W.; Klarquist Sparkman, LLP, One World Trade Center, Suite 1600, 121 SW Salmon Street, Portland, OR 97204 (US).
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 2005/069955 A2

(54) Title: SUPERCRITICAL FLUIDS IN THE FORMATION AND MODIFICATION OF NANOSTRUCTURES AND NANOCOMPOSITES

(57) Abstract: Embodiments of nanostructures and nanocomposites and embodiments of methods for forming and modifying these nanostructures and nanocomposites are disclosed. The methods can include transporting a metal, metallic compound or precursor to a surface of a nanostructure substrate in a carrier while the carrier is in supercritical fluid form. Embodiments of the disclosed methods can be used to form catalytic structures, such as catalytic structures including nanostructure supports and catalytic metallic nanoparticles attached to the nanostructure supports. These catalytic structures are useful for catalyzing reactions in fuel cell applications, such as oxygen reduction and methanol oxidation reactions. Some of the disclosed nanostructures and nanocomposites include carbon nanotubes.